DNR Indiana Department of Natural Resources

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MEMORANDUM 2006-6

To: All Indiana Oil and Gas Operators

From: Herschel McDivitt, Director

Date: December 8, 2006

Subject: Alternate Well Construction Method – Cable Tool Gas Wells in Trenton Formation, Use of Bentonite in Driven Pipe Annulus

Earlier this year, in response to a request from a cable tool drilling contractor, I approved the use of an alternate well construction method which allowed the placement of bentonite in the drive pipe (conductor) annulus rather than cement. The approval was granted on a trial basis to allow for the use of this alternate method for certain gas wells drilled in the Trenton Field with cable tools. After evaluating this method, I have determined that it is an acceptable method of well construction in limited situations and am authorizing the use of this method in a manner consistent with this memorandum.

The following is an excerpt from my response to the specific request which provides an explanation of the alternate method and a justification for its use:

> "This responds to your written request received October 20, 2006, regarding the use of bentonite as a sealing material in the annulus of the outermost driven casing, in lieu of cement as specified in our oil and gas rules at 312 IAC 16-5-9 (a)(3). Your request has been reviewed as an alternate well construction method to determine whether it meets the requirements of 312 IAC 16-5-9 (d) which gives discretionary authority to the Director of the Division of Oil and Gas to consider alternate well construction methods where they meet certain criteria. In the case of your request, the alternate method must be found to not cause the pollution of, endanger, or threaten any underground source of drinking water.
>
> The outermost driven casing for cable tool wells has arguably been considered as surface casing by many in the industry. I would tend to agree where this casing was primarily driven to a specific depth in order to provide protection to underground sources of drinking water. Such casing strings must be installed in a manner which ensures that the annular space between the outside surface of the casing and the walls of the formations penetrated are sealed with an impervious material, usually cement, in order to prevent the movement of any fluids through the annular space and thereby posing a threat to contamination of fresh groundwater resources.
>
> However, in the cases which you have described in our earlier conversations, the primary purpose for installing the outermost driven casing in Trenton gas wells located in areas with thicker layers of surface sediments, is to provide stability of the wellbore by preventing the settling or caving of the hole until proper surface casing can be installed in the well. This casing is often referred to as "conductor". Significant underground sources of drinking water which must be properly cased off are usually found in deeper consolidated formations below any depth at which the outermost driven casing would be set. In these situations, the true surface casing would be the next innermost casing installed in the well inside the outermost driven casing.

Wells in areas with thinner layers of surface sediments can often be drilled with cable tools using oversized bits allowing the placement of cement behind the casing, whereas wells drilled in areas of thicker surface sediments with sand and gravel layers are not able to be completed in a manner which allows for the pumping of an adequate cement barrier in the annulus. Where this casing string is the primary means of providing protection to underground sources of drinking water, this type of completion is unacceptable. However, where an inner string of casing is to be set to a depth below the lowermost underground source of drinking water and cemented to surface, I believe that an alternate method, such as the one you have proposed may be considered for purposes of sealing the annulus of the conductor or outermost driven casing.

The method you have proposed is consistent with that allowable by the Division of Water for the construction of water wells by cable tool methods under 312 IAC 13. This method has been found to be an effective means of sealing the annulus of driven casing in order to prevent the downward migration of surface contaminants into groundwater along the annulus of the casing. Other states have also developed specific guidelines for the grouting of driven water well casing (see Ohio Department of Natural Resources Fact Sheet 93-19 titled "Dry Driven Grout Method"). The placement of bentonite is accomplished by digging an area approximately 3' deep by 6" wide around the circumference of the pipe to be driven, and then filling the excavation full of dry, granular bentonite. As the casing is driven, the bentonite moves down the annulus along the casing. The excavation must be maintained full of bentonite until the casing is set at final depth."

The use of granular bentonite is commonly used in the construction and abandonment of water wells and ground water monitoring wells. When used properly, it is a very effective material for sealing abandoned well bores and annular spaces in order to prevent the movement of fluids and thereby protect against contamination of groundwater. After observing a number of successful applications of this method, I am herein approving its use with the following conditions:

1. This method shall be used only for new gas wells drilled with cable tools in the established Trenton limestone reservoir where the operator needs to set an outer conductor pipe casing (conductor) to be driven through the lowermost unconsolidated strata for the purpose of stabilizing the borehole.
2. The borehole into which the surface casing (commonly referred to in the Trenton area as the "water string") will be installed is recommended to be at least 2" in diameter greater than the outside diameter of the couplings on the surface casing. In no case shall the borehole size be less than 1" in diameter greater than the outside diameter of the couplings on the water string.
3. The surface casing shall be installed at least fifty feet (50') below the top of the Maquoketa Shale and circulated with cement to the surface using a method approved by the Division Director.
4. It is recommended that centralizers be used when installing the surface casing sufficient to ensure a uniform thickness of cement in the surface casing annulus.
5. When the conductor (outermost) casing is driven, the operator must use a method approved by the Division Director for placing dry granular bentonite or other suitable sealing material allowable under 312 IAC 13 for use in the construction of water wells behind the conductor pipe. The method used to place the sealing material behind the driven casing shall be similar to that described in the following publications:
    a. The "Dry Driven Grout Method" published by the Ohio Department of Natural Resources as Fact Sheet 93-19; or
    b. The "Michigan Water Well Grouting Manual", October 1987 edition (see Figure 23 and the section titled "Dry Granular Bentonite Around Driven Casings").
6. Where this method is to be used, the permit applicant shall indicate their intent to do so in Part III of the Well Permit Application and refer to this approval.
7. Prior to utilizing this method, the well owner or operator shall provide at least a 48-hour notice to the Oil and Gas Inspector before commencing to drill the well.

Questions regarding this document can be directed to me by e-mail at hmcdivitt@dnr.in.gov, or by phone at (317) 232-4058.

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